

storm might be of material value. A single fire often costs thousands of dollars. Is it not possible that a dependable warning could be given? The behavior of radio and telephone instruments during and just before electrical storms and the researches of one or two eminent meteorologists all suggest an affirmative answer.

Again, the forest officer must decide, often in the absence of any unusual number of going fires, whether the time is ripe for the expansion of his forces, to the limit, to a moderate degree, or not at all. Past experience is the only true basis for judgment. Accurate and readily available weather records should supplement, or probably I should say supplant, memory in forming the basis for a judgment which may involve thousands of dollars. Can the meteorologist predict a week or a month in advance the probable general trend of the season?

The researches of Huntington, Douglas, Ricard, and others at least suggest that there are undeveloped possibilities in this line. Casual local observations indicate

that there may possibly be a very intimate relation between local summer rainfall and the depth of snow on the higher ranges during the months of May and June.

Briefly, in summarizing the idea set forth in the title of this paper, it may be said that there is at least some warrant for the belief that weather forecasting can aid forest-fire control in at least three different ways, namely—

1. By warning through the usual 36-hour forecasts of an approaching change in the weather which will influence the behavior of possible or going fires.

2. By means of special forecasts which will give warning six or more hours in advance of the occurrence of lightning in any given locality.

3. By warnings through long-range forecasts, based on sunspot or other phenomena, of the approach of abnormal seasons comparable to the seasons of 1889, 1910, and 1919 in the northern Rocky Mountain region.

### METEOROLOGICAL FACTORS AND FOREST FIRES.<sup>1</sup>

By J. V. HOFMANN.

A gathering of foresters with, and at the invitation of, meteorologists marks the realization of the long-felt need of a close correlation of these natural sciences. This accomplishment leaves behind the cry of the insistent few who were ever urging unity of purpose and cooperation and opens the door to a new era of development that will apply all of the scientific facts to the existing conditions. Meteorological factors and forest development are inseparable in nature, and progress in the establishment of a forestry practice will be measured by the extent that these factors are made inseparable in the study of the sciences. The correlation of the meteorological factors needs no discussion at this meeting, consequently this paper is confined to the individual or collective relation of these factors to the forest conditions.

Although all of the climatic factors are related to the development of the forest, those directly related to the forest fire problems are most important because the control of the fire situation is the greatest question in the conservation of the timber supply. The study of the influence of climatic factors on fire hazard has been continued for two years by the Wind River Experiment Station. These studies have included the effect of all of the meteorological factors on forest fire conditions as well as on the behavior of the fire. Temperature, evaporation, wind and other factors influence the fire hazard, but the relative humidity was found to be the most important factor in the development of a dangerous fire period as well as the most usable factor in actual fire control. \* \* \*

Studies conducted by the Wind River Forest Experiment Station of the effect of relative humidity on forest fires showed that fires did not spread when the relative humidity was above 60 per cent. That they spread very slowly and only in very favorable material when the humidity was between 50 and 60 per cent. When the humidity was between 40 and 50 per cent fires picked up, varying from a few running fires to fires that merely smoked up and did not spread. With a humidity of 30 to 40 per cent fires gained some headway and some rapidly spreading fires occurred. A humidity below 30 per cent caused all fires that were in material that would

allow spread at all to gain headway, or spread beyond control. Crown fires occurred when the humidity dropped to 25 per cent or lower. \* \* \*

Unquestionably one of the main causes of our enormous fire losses has been due to the failure to realize how very suddenly forest materials may change from a low degree of inflammability to an extremely high degree of inflammability and convert in a few hours fires which have been smoldering harmlessly for days into raging conflagrations.

A realization of this situation can lead to only one conclusion, that the smoldering fires must be put out immediately while they are small, when they can be handled at small expense and before conditions change. \* \* \*

The season of 1923 has been one of exceptionally low fire hazard in the Pacific Northwest, although on September 12 the deficit in precipitation was nearly 6 inches. Temperature has been high during some periods, but on the whole the relative humidity has been low for only short periods or days. However, a low period of humidity during the first days of September caused the most serious fire period of the year which resulted in many fires that spread rapidly and were beyond the control of the fire fighting forces until September 8 and 9 when the relative humidity remained high again. \* \* \*

The correlation of the meteorological factors and the forest fire hazard that has been discussed in this paper emphasizes the importance of the relative humidity and shows that it is the principal factor that can be used as an index of the fire conditions as well as its direct use in fire control.

With this fact established it is evident that the greatest need in forest fire prevention and control is a knowledge of changes in relative humidity as far in advance as possible.

Recognizing this point, the Wind River Experiment Station is now conducting studies to determine the relation between relative humidity and static electricity. This study has progressed far enough to demonstrate a definite relation, and furthermore that static can be used as a basis for the prediction of changes in humidity.

<sup>1</sup> Excerpts of paper read at meeting of American Meteorological Society at Los Angeles, Calif., September, 1923.